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STUDY OF SPORE ORNAMENTATION OF TWO MOSSES FROM WEST BENGAL AND SIKKIM

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ABSTRACT

Two moss species *Trematodon longicollis* Michx. and *Bartramia ithyphylla* Brid. have been studied with regard to morphology and spore exine ornamentation. Under SEM the exine of both *T. longicollis* and *B. ithyphylla* spores are characterized by verrucate ornamentation. On the basis of morphological characters and exine ornamentation, the taxonomic position of these two species is discussed.

Keywords: *Bartramia*, *Trematodon*, moss, spore-ornamentation, taxonomy

INTRODUCTION

Apart from the monumental work on the moss flora of Eastern India by Gangulee (1971-1980) there are very few reports on the occurrence and taxonomy of mosses from West Bengal specially from plains. Bhattacharya (2005) reported 10 species of moss belonging to the genera *Physcomitrium, Fissidens, Erpodium, Semibarbula, Octoblepharum, Bryum, Taxithellium* and *Hyophila* from the district of Barddhaman, West Bengal. Singh & Ghosh (2007) described 25 species of bryophytes, comprising 16 mosses, 7 liverworts and 2 hornworts from various habitats in Indian Botanic garden, Howrah. There were 5 new records from Gangetic plain and 2 new records from the State of West Bengal. Most of these taxonomic studies did not involve spore ornamentation pattern through Scanning electron microscopy (SEM). Importance of spore wall morphology has been emphasized upon for long (Sorsa & Koponen, 1973; Vitt & Hamilton, 1974; Hirohama, 1976). Subsequently, many significant works on the spore wall morphology in mosses were undertaken (Rushing, 1985, Carrino & al., 1995; Guisen & al., 1997; Luigi-Ponzo & Barth, 1998; 2010; Khosravesh & Osoloo, 2007; Savaroglu & Erkara, 2008). From West Bengal, Agrawal (1985) described spore wall ornamentation in 12 moss species. Present work is providing here the SEM details of two species viz., *Trematodon longicollis* and *Bartramia ithyphylla* and their morphological characters are described.

MATERIALS AND METHODS

Collection site:

(a) This population of *Trematodon longicollis* has been collected, in the month of August, from Rajbandh (23° 28' 34" N and 87° 23' 55" E) area of the district of Barddhaman in the state of West Bengal. The population was found growing on the soil which is of red lateritic nature. Associated angiospermic plant was *Ixora* sp. Populations of *Bartramia ithyphylla* were collected from Ranipool (27° 17' 31.92" N, 88° 35' 31.92" E), a suburban near Gangtok, East Sikkim in the month of September, 2011. The population was growing on sloppy rock and mud surface with low illumination.

Voucher specimens are kept in the herbarium of the Department of Botany, Visva-Bharati.

(b) For SEM studies the oopsores were not acetolysed. Thoroughly dried spores were mounted on specimen stubs having double sided sticky tape. The spores were coated with Gold-Paladium by a sputter coater and observed with Hitachi S530 SEM at an accelerated voltage of 15 KV (located at sophisticated instrumentation center of Burdwan University).

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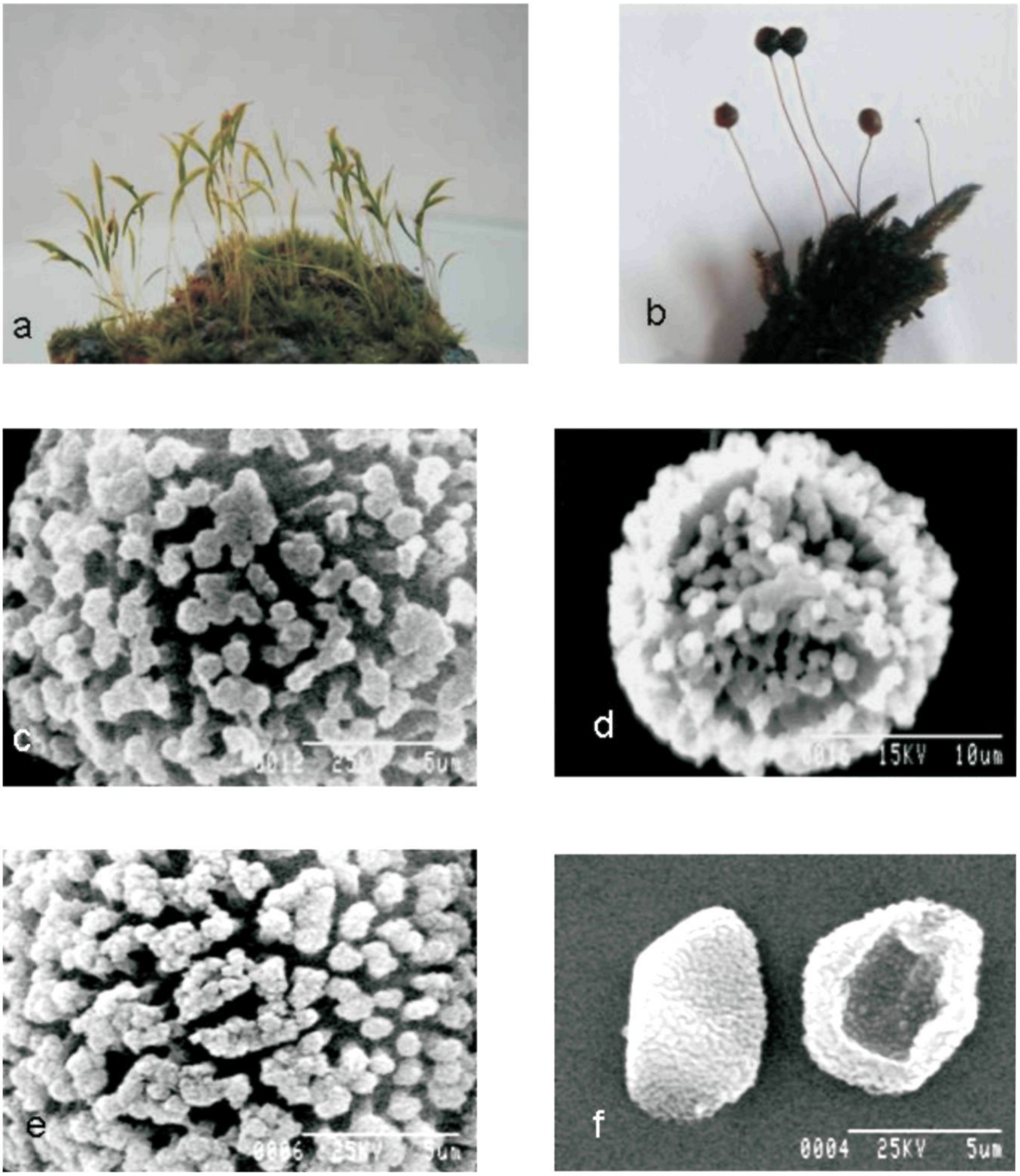

Plate-1: a. *Trematodon longicollis* **b.** *Bartramia ithiphylla*; **c.** Verrucate exine ornamentation of spore; **d.** Trilete spore aperture in *T. longicolis* (proximal view); **e.** Verrucate exine ornamentation of spore; **f.** Quadrangular katalept aperture of *B. ithiphylla* (proximal view).

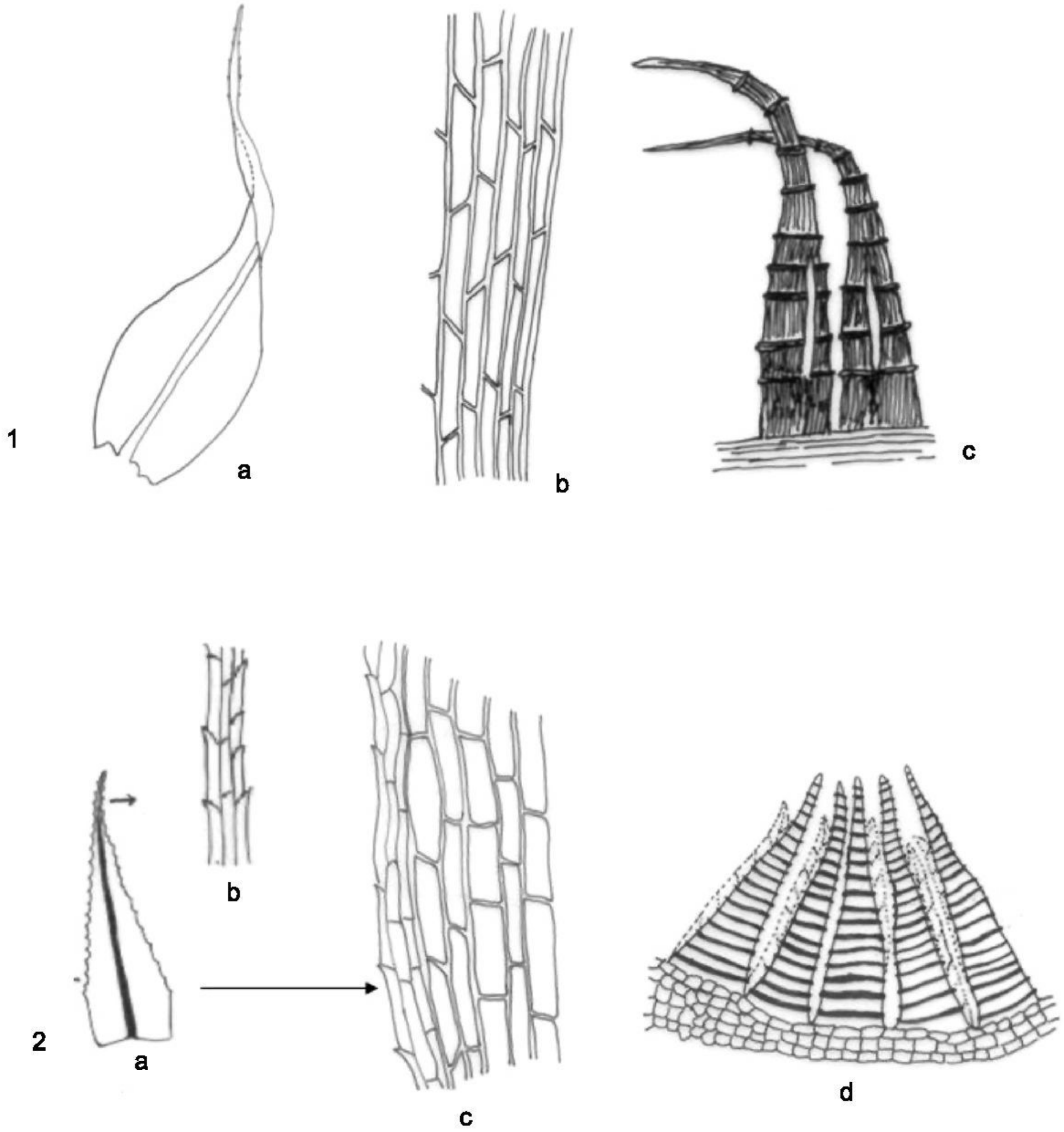

Plate-2 : 1. ***Trematodon longicollis*** **a.** **Leaf, b.** Alar cells, **c.** Peristome teeth; **2.** ***Bartramia ithiphylla*** a. Leaf, b. Cells at tip, c. alar cells, d. Peristome teeth

MORPHOLOGICAL DESCRIPTION

(I) *Trematodon longicollis* Michx. (Plate 1, a)

Plants bright green; Stems 3.5-5.5 mm high; Leaves erect spreading, flexuose, 2.5 – 4.0 mm long, suddenly tapering from a broad, ovate-rectangular, concave sheathing base to a long, narrow, canaliculate apex, wide sheathing base about 1/8th the total length of the leaf, margin slightly toothed at the tip, entire below (Plate B, 1a); Costa yellow-brown, narrow at base, somewhat dilated at leaf neck, not filling whole of subula, ending slightly below apex; Laminar cells rectangular (54 - 70 x 11 - 14 μ), smaller rectangular (11 - 24 x 5.4 - 8μ) above; Alar cells (84 - 84.5 x 12 – 18 μ)-marginal (Plate 2, 1b); Seta pale yellow, erect, twisted when dry; Capsule cylindrical, usually curved, yellow-brown, urn ovate cylindrical, 2 – 3.5 mm long, ± 1 mm in diameter, tapering into a 9 mm long (2 – 3 times the urn), apophysis which is curved and cylindrical with a struma at base; Stomata present on apophysis; Peristome teeth red-brown ± 0.5 mm high, split into two unequal prongs by perforation but united at top, vertically striolate and with nodes, papillose at tip (Plate 2, 1c); Spores round opaque, yellow-brown, 18 – 22.5 μ in diameter; Calyptra cuculate, entire at the base, covering more than half the urn, ± 4 mm long;

Operculum conic-rostrate, curved shorter than urn, smooth; Exine ornamentation is verrucose both in proximal and distal view, trilete aperture in proximal view (Plate 1, c,d).

Specimen examined: India, West Bengal, Burdwan district, Rajbandh, 23° 28' 34" N and 87° 23' 55" E, 15.9.2011, M. Debnath, 51, Terrestrial.

Distribution: South India, North-East India (Darjeeling, Assam, Manipur), Western Himalaya, Sri Lanka, China, Japan, Korea, Myanmar, Phillipines, New Guinea, Taiwan, Siberia, South Africa, Europe, New Zealand (Gangulee, 1971).

(ii) *Bartramia ithiphylla* Brid. (Plate 1, b)

Plants yellow-green; Stem erect, 2.2 cm long, densely covered by leaves; leaves rigid, erect, lanceolate-subulate from a wider, oblong sheathing base, 2-3 mm long, 1 mm wide at base, margin entire at the base, denticulate above (Plate B, 2a); leaf cells towards apex rectangular, sharply papillose, 50-60 μ x 7.5 -10 μ, basal cells hyaline, larger, 85 -100 x 15-20 μ, (Plate 2, 2c), costa percurrent. Seta apical (lateral by subsequent growth of stem), erect, red, 1.6-2.2 cm long; Capsule erect, rounded, light brown, 2.5 mm long, 2 mm in diameter, deeply furrowed when dry; Operculum is conical; Peristome teeth diplolepidous, metacranoid, exostome reddish, lanceolate 300 – 320 μ high and 60-62.5 μ wide at the base; endostome shorter than exostome 250 μ long. Spore rounded, 25-30 μ in diameter. Exine ornamentation verrucose, quadrangular katalept aperture in proximal view (Plate 1, e, f).

Specimen examined: India, Sikkim, Ranipool, 27° 17' 31.92" N, 88° 35' 31.92" E, 23.8.211, M. Debnath, 52, Terrestrial.

Distribution: Western Himalaya, China, Siberia, Japan, Taiwan, Europe, North America, Mexico, South America, North Africa (Gangulee, 1971).

DISCUSSION

Brotherus (1909) included the genus *Trematodon* in the family Dicranaceae along with *Bruchia*. Bitton (1913) placed these two genera together with *Pringleella* in the famly Bruchiaceae. Gangulee (1971) placed the genus *Trematodon* in the family Dicranaceae and sub-family Trematodontoideae within the order Dicranales. Buck (1979) stated that *Bruchia* and *Trematodon* are rather distinct from the Dicranaceae and included these genera along with *Eobruchia* and *Pringleella* in the family Bruchiaceae because of the long-necked and stomatose capsules with round stomata. However, the large size and the ornamentation of the spores constituted important characteristics that suggested the need for further studies. Spore morphology was an important character in Buck's (1979) proposal to revalidate the family Bruchiaceae. Buck and Goffinet (2000) placed *Trematodon* along with *Bruchia* and *Pringleella* in Bruchiaceae within the order Dicranales.

Rushing (1985) reported varied types of ornamentation of distal spore surface in several species of *Bruchia* by SEM – worty or verrucate, pitted, reticulate and spinose. The ornamentation in *Bruchia bolanderi* was of warty (verrucate) type and proximal surface showing triangular formation of row of spines. Luizi-Ponzo and Barth (1998) studied spore ornamentation in several species of *Bruchia* and *Trematodon*. Two basic types of ornamentation pattern were recognized – gemmoid and elongated processes. The ornamentation pattern study separated Bruchiaceae from Dicranaceae. Luizi-Ponzo and Barth (1998) also showed gemmoid ornamentation of *T. longicollis* while *T. brevifolius* showed elongate type of ornamentation but the dense arrangement was similar to other species. Here also variation within a single genus is documented. Present populations of *T. longicollis* studied also showed warty verrucose ornamentation with trilete proximal end which resembles Bruchiaceae. Likewise, verrucate type of spore ornamentation also observed in *B. ithyphylla*. Therefore the placement of *Trematodon* and *Bartramia* in Bruchiaceae is supported.

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पश्चिम बंगाल व सिक्किम की दो मॉस जातियों के बीजाणु अलंकरण का अध्ययन

शिवली भट्टाचार्य, मनोजीत देवनाथ एवं *समित रे*

सार सारांश

ट्रेमैटोडॉन लोंगिकॉलिस मिशाक्स और *बरट्रामिया इथिफाइला* ब्रिड नामक दो मॉस जातियों की आकारिकी और बीजाणु अलंकरण का अध्ययन एस.ई.एम. द्वारा किया गया है। *टी. लोंगिकॉलिस* और *बी. इथिफाइला* दोनो जातियों के बीजाणु की वाह्य सतह वेरूकेट है। इनके वाह्य आकारकीय गुणो तथा बीजाणुओं की वाह्य सतह के लक्षणों के आधार पर इनकी वर्गिकीय स्थिति की विवेचना की गयी है।